*Beyond performance: how do students in urban schools perceive science issues?*

**Objectives and Motivation**

In most countries and economies, students who attend schools in urban areas tend to perform at higher levels than other students. Often these schools benefit from improved educational resources and greater autonomy in the allocation of these resources (OECD 2013).

Using data from the Program for International Student Assessment (PISA), this analysis examines differences in student science performance in urban versus non-urban schools across all countries over four separate PISA cycles (2006, 2009, 2012, and 2015).

Because the focus for the 2015 PISA cycle is the assessment of science, this analysis also examines three key topics: (1) students’ awareness of environmental issues, (2) students’ optimism about environmental issues, and (3) students’ beliefs about scientific epistemology across urban and non-urban schools.

Little research has gone beyond the performance levels of students in urban schools, and the research that does mostly focuses on the resources that urban schools have access to. Understanding how variables that are connected to students’ perception and beliefs about science and science issues will provide insight into how to improve the overall learning environment.

**Research Methods**

This paper uses the school location variable of the PISA school questionnaire (introduced in the 2006 cycle of PISA), which asks principals in what kind of community their school is located. An urban school is defined as a school located in a community of more than 100,000 people (OECD 2013).

Students’ awareness of environmental issues is collected by students’ responses to a question about how informed students are about the following environmental issues: the increase of greenhouse gases in the atmosphere, the use of genetically modified organisms, nuclear waste, the consequences of clearing forests for other land use, air pollution, extinction of plants and animals, and water storage.

Results show the percentages of students who *have never heard about this,* and *have heard about this but would not be able to explain what it is really about*. Students who select these two responses are considered to be “unfamiliar.” Students who select that they *know something about this and could explain the general issue* or select that they are *familiar with this and would be able to explain this well* are considered to be “familiar.”

Students’ optimism about environmental issues concerns the same seven topics as the awareness question, and students’ are classified into the three groups: whether the students think the issues will *improve*, *stay about the same*, or *get worse*. For binary analyses, the response *improve* is coded as “optimism” and *get worse* and *stay about the same* are considered as “less optimistic” responses.

Beliefs about scientific epistemology are collected by students’ responses on a four-point Likert scale to the six statements found in Table 4. The Likert scale is converted into a two-point scale for the binary analyses.

Statistical *t*-tests are performed for the comparison of achievement scores and percentage of students’ responses to the aforementioned questions. Linear, logit, and probit regression analyses are used to control for performance when using the non-cognitive variables as outcomes.

**Preliminary Results**

Table 1. Number of jurisdictions in which students in urban schools perform better or worse than students in non-urban schools, PISA 2015, science

|  |  |  |  |
| --- | --- | --- | --- |
|  | Urban students better | Urban students worse | Total countries |
| 2006 | 33 | 3 | 53 |
| 2009 | 43 | 2 | 64 |
| 2012 | 36 | 0 | 58 |
| 2015 | 49 | 3 | 63 |

Table 2. Number of jurisdictions in which students in urban schools are more or less familiar with environmental issues than students in non-urban schools, PISA 2015

|  |  |  |
| --- | --- | --- |
|  | Urban students more familiar | Urban students less familiar |
| Air pollution | 34 | 2 |
| Deforestation | 31 | 5 |
| Extinction | 29 | 1 |
| GMOs | 23 | 2 |
| Greenhouse gas | 31 | 3 |
| Nuclear waste | 13 | 2 |
| Water shortage | 24 | 1 |

Table 3. Number of jurisdictions in which students in urban schools are more or less optimistic about environmental issues than students in non-urban schools, PISA 2015

|  |  |  |
| --- | --- | --- |
|  | Urban students more optimistic | Urban students less optimistic |
| Air pollution | 1 | 19 |
| Deforestation | 4 | 18 |
| Extinction | 2 | 22 |
| GMOs | 8 | 7 |
| Greenhouse gas | 2 | 22 |
| Nuclear waste | 3 | 12 |
| Water shortage | 4 | 18 |

Table 4. Number of jurisdictions in which students in urban schools agree with statements about scientific epistemology than students in non-urban schools, PISA 2015

|  |  |  |
| --- | --- | --- |
|  | Urban students agree more | Urban students agree less |
| A good way to know if something is true is to do an experiment | 29 | 2 |
| Ideas in science sometimes change | 28 | 2 |
| Good answers are based on evidence from many different experiments | 32 | 2 |
| It is good to try experiments more than once to make sure of your findings | 26 | 2 |
| Sometimes scientists change their minds about what is true in science | 20 | 1 |

**Significance**

This paper provides a cross-national picture of urban versus non-urban students’ performance in science and how it relates to its awareness of environmental issues, optimism about environmental issues, and approaches to scientific epistemology. I show that in most countries, urban students are more aware of environmental issues, less optimistic about the future with regard to the problems associated with environmental issues, and agree with epistemological questions of science. These are all variables that are strongly correlated with performance on the science section of PISA, though a causal relationship cannot be inferred one way or the other.

**References**

OECD (2013), "What Makes Urban Schools Different?", *PISA in Focus*, No. 28, OECD Publishing, Paris.